ASSESSMENT OF THE PRODUCTION AND MARKETING CONSTRAINTS OF DAIRY GOAT AND GOAT MILK FACED BY RURAL HOUSEHOLD DAIRY-GOAT FARMERS IN SEKHUKHUNE DISTRICT OF LIMPOPO PROVINCE SOUTH AFRICA

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DECLARATION

I, Lesedi Molefe Maesela, of student number 58527435, declare that the dissertation hereby submitted to the University of South Africa (UNISA) College of Agriculture and Environmental Science for the degree of Masters of Science in Agriculture is my own work and has not been submitted by me to this university or any other universities and that all material used has been fully acknowledged.

Signature: _____

Date: _____

DEDICATION

This work is dedicated to my baby girl, Refentse, who was born during the initiation stage of this study and my father, Paul Thlatludi Maesela, who passed away 14 years ago; I wish that he was here to celebrate my achievements. To my mother, Margaret Mathibela Maesela; fiancé, Radipatla Evans Letlape; and sisters and brothers, thank you all for giving me support and courage that enabled this achievement.

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I would like to express my special gratitude to My Lord who aided and allowed me to reach these achievements; with God, everything is possible.

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Psalm 20:7
Some trust in chariots and some in horses,
but we trust in the name of the Lord our God.

ABSTRACT

This study was conducted to analyse the marketing and production constraints of dairy goats and goat milk faced by rural household dairy goat farmers in Sekhukhune District of Limpopo Province, South Africa. The study was conducted in five Local Municipalities of the Sekhukhune District and each district was selected based on the population of dairy goat farmers and their production potential and availability. The primary data pertaining to the reason for keeping dairy goat and goat milk marketing were collected with the use of households' interviews using structured questionnaires administered to 110 respondents selected purposively based on the population of dairy goat farmers in the area. Data were analysed descriptively. Simultaneously, the Probit model was used to analyse production and marketing constraints of dairy goat and goat milk as well as factors influencing the farmers' decision to milk dairy goat in the study area. Results indicate that dairy goat production and goat milk marketing in the Sekhukhune District is practised by more women than men. This activity is rarely practised by the youth. In addition, the majority of the farmers keep four dairy goats in one kraal. Also, dairy goats in the Sekhukhune District relies more on natural pastures and less on supplementary feeds for their survival. On the other hand, the results of the Probit analysis revealed that safety of dairy goat and grazing land are major constraints of dairy goat production while, breeding and processing are major constraints of goat milk marketing faced by rural household dairy goat farmers. Furtherance to this, breeding, processing and grazing land are the factors that significantly increase the farmers' decision to milk dairy goat. It is therefore concluded that greater intervention of the government, formation of dairy goat cooperatives, attendance of agricultural trainings and workshops by farmers and provision of veterinary health service should be employed to solve existing constraints in the study area.

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LIST OF ABBREVIATIONS/ACRONYMS

CDF	Cumulative Distribution Function
LDA	Limpopo Department of Agriculture
PM	Probit Model
PRM	Probit Regression Model
RHDGF	Rural Household Dairy-Goat Farmers
SA	South Africa
SD	Sekhukhune District
SPSS	Statistical Package for Social Sciences

CHAPTER ONE
INTRODUCTION

1.1 Background

Goats are the most essential traditional livestock found abundantly in most rural areas of South Africa (SA). They can be kept for subsistence or commercial production purposes (Department of Agriculture, 2011); however, most households' goat farmers' rear goats with no purpose, either subsistence or commercial purpose or both. Rural Household Dairy-Goat Farmers (RHDGF) in the Sekhukhune District (SD) keep their goats and other livestock in one kraal. They pay less attention to the management of goat production and the importance of keeping goats. In addition, there is a lack of information regarding market infrastructure or middlemen that market live goats in rural areas of South Africa. Goats are normally marketed informally mainly as live goats for religious, traditional, and other ceremonies such as weddings and parties (DAFF, 2012) to raise income. Also, it is very rare to find goats by-products such as goat milk in supermarkets or shops for sale in rural areas of South Africa. Dairy goats are usually found in smaller numbers compared to dairy cows, which gives households less amount of goat milk than cow milk.

Often, goats produce milk for households' consumption instead of producing commercial purposes. Moreover, the farmers lack storage facilities to store their milk and to keep it healthy. To add, this is irrespective of the fact that goats' milk has been considered as the most healthy and nutritious milk suitable for non-breast feeding children, including people allergic to cow milk and people with different diseases (Edward, 2015).

Household farmers lack commercial processors to add value to their goats' milk, since is against the law to sell raw milk in most provinces unless it has been approved by the province milk inspectors (Park, 2011). Perhaps dairy goats and their milk can serve as alternative source of income at household level. They can best be used as a tool of poverty alleviation and to improve rural livelihoods, however, rural household goat farmers face some constraints that restrict them to benefit from keeping their goats.

This study therefore aims to assess production and marketing constraints of dairy goats and their milk faced by Rural Household Goat Farmers in the Sekhukhune District of Limpopo Province, South Africa.

1.2 Problem Statement

Dairy goats are one of the most significant small ruminants which household farmers can benefit from rearing. They are more appropriate for Rural Household Goat Farmers since they are less expensive, they produce enough milk for household consumption and require a lower amount of food that is affordable by Rural Household Goat Farmers. Moreover, they have relatively short generation interval and, lastly, they require minimum management compared to dairy cow (Donkin, 2011). However, irrespective of this their good qualities and benefits to mankind, studies on the production and marketing constraints of dairy goat and goat milk in rural areas of South Africa such as the Sekhukhune District of Limpopo Province with its high population growth, poverty, unemployment and inequality in terms of income distribution are limited or non-existence. Thus, it is envisaged that knowledge of the production and marketing constraints of dairy goat and goat milk in rural areas will help to enhance the livelihood of farmers thereby alleviating poverty. Therefore, this study is intended to ascertain the production and marketing constraints of dairy goat and goat milk faced by rural household dairy-goat farmers in the Sekhukhune District.

1.3 Research Question

Based on the above introduction and problem statement, the following research questions were formulated:

i. What socio-economic characteristics of the Rural Household Dairy-Goat Farmers influence production, milking and marketing of dairy goats?
ii. Do these socio-economic characteristics of the Rural Household Dairy-Goat Farmers influence production, milking and marketing of dairy goats positively or negatively?
iii. What are the constraints faced by rural household goat farmers in running dairy-goats production enterprises and goat-milk marketing in eleven (11) rural villages found in five (5) municipalities of the Sekhukhune District of Limpopo Province of South Africa?

1.4 Motivation of the Study

Dairy goats and its milk can act as a tool to improve livelihoods of rural people and the entire economy of South Africa. However, rural household goat farmers face some constraints that must be addressed if an efficient and effective dairy-goat production should be realised. Thus, it is expected that an efficient dairy-goat production enterprise in rural areas will help to improve productivity of the goats and help in alleviating some of the economic and social challenges faced by the rural households. Therefore, the motive of the study is to assess those constraints faced by rural household goat farmers and to identify some possible strategies to overcome existing constraints within the area.

1.5 Aim and Objectives

1.5.1 Aim

The main aim of the study is to ascertain the marketing and production constraints of dairy goats and goat milk faced by Rural Household Dairy-Goat Farmers in the Sekhukhune District.

1.5.2 Objectives

The specific objectives of the study are, namely:

i. To determine socio-economic characteristics of Rural Household Dairy-Goat Farmers in the Sekhukhune District;
ii. To identify the production and marketing constraints of dairy goats and their milk faced by Rural Household Dairy-Goat Farmers in the Sekhukhune District;
iii. To determine the factors influencing farmers' decision to milk dairy goat in the study area; and
iv. To determine the possible strategies to constraints for efficient production and marketing of dairy goats and goat milk faced by Rural Household Dairy-Goat Farmers in the Sekhukhune District.

1.6 Hypothesis (H_0)

It may be hypothesised that socio-economic characteristics of the rural household dairy-goat farmers influence production, milking and marketing of dairy goats.

1.7 Significance of the Study

The study is willing to share valid and useful information (research outcomes) about the significant role of goats and the by-products to the Department of Agriculture, thus hoping that they will take corrective actions by promoting dairy-goat production and marketing of goat milk and goat-milk by-products. It is also significant in alerting rural people about the importance of keeping goats so that they can improve their livelihood by rearing dairy goats.

1.8 Limitations of the Study

This study is therefore limited to the production and marketing constraints of dairy goat and goat milk. The study omitted production constraints of goat producing meat and marketing constraints of goat meat, as well as all small ruminants produced in rural areas of the Sekhukhune District such as cattle, sheep etc.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

Dairy-goat production is the most important production in our country. Rural household farmers rear goats but none of them is aware of commercial and consumption benefit from rearing goats. Dairy-goat production is the process of rearing and managing dairy goats and its by-products such as milk. Marketing involve communicating product or its value, service or brand to consumers for the purpose of promoting or selling that particular product, service, or brand (*Marketing Magazine*, 2012).

There are several productions constraints that hinder dairy-goat production and marketing associated with goat milk. Some of those production and marketing constraints include poor feeding, inadequate breeding, inadequate grazing land, inadequate processor, absence of middlemen, inappropriate transport facilitators etc. The literature below discusses characteristics of dairy goats and identifies constraints of dairy-goat production and marketing associated with goat milk.

2.2 Dairy Goat and Their Characteristics

Healthy dairy goats have good qualities. They have the ability to produce lots of milk and they are very productive. Dairy goats live a long productive life and have ability to transfer their traits to their offspring through breeding or otherwise. Furthermore, they have the ability to survive under environmental conditions that are difficult for other domestic small ruminant (Lai *et al.*, 2015). Dairy goats are mainly characterised per breeds. There are many dairy-goat breeds such as Saanen, Nubian, Toggenburg, Alpine and many more. The highest yielding dairy breed goat in SA is Saanen and Alpine. Saanen is white or cream white in colour. It is large and it has big bones. It produces 1.7l in its first lactation per day (*Farmer's Weekly*, 2012). It has been selected because of its higher productivity, ease of management in herds and adaptability. It is sensitive to harsh sunlight and hot climates because of its colour (NSBA, 2013).

Figure 2.1: Saanen breed dairy goat (National Saanen Breeders Association, 2013)

An alpine breed goat has been selected because of higher butterfat content. In addition, it is medium to large sized breed, with upright ears that offers all colours. Its colour range from white or grey to brown and black (ADGA, 2015). Alpine was selected in SA because it has high milk productivity.

Figure 2.2: Alpine breed goat (American Dairy Goat Association, 2015)

2.3 Dairy Goat Milk, Composition and Characteristics

Goats Milk is richer because it has more calcium, phosphorous, iron, fat, and protein than cow milk or human milk. Furthermore, it is better for the family as it has a high nutritional content. The milk is more suitable for non-breast feeding human, people allergic to cow milk and people suffering from different diseases such as heart disease, sugar diabetes etc. (Edward, 2015). Moreover, it can best be used at household level for consumption as well as for commercial purpose. Goat milk compositions differ from human and cow milk. The difference is determined by their diet, breed, season, feeding, environmental conditions, management and stage of lactation (Rewati, 2012).

Table 2.1: Goat Milk Composition Compared to Cow Milk and Human Milk

Particulars	Per 100 Gram		
	Goat milk	Cow milk	Human milk
Calcium (mg)	134	119	32
Phosphorus (mg)	111	93	14
Protein (%)	3.56	3.29	1.03
Fat (%)	4.14	3.34	4.38
Iron (mg)	0.05	0.05	0.03

Source: (Rewati, 2012)

2.4 Production Constraints Faced by Dairy-Goat Farmers

Mburu *et al*. (2014) have conducted research on the factors affecting Kenya Alpine Dairy-Goat Milk Production in the Nyeri Region. About 190 smallholder farmers were sampled to assess the milk yield of the dairy goats reared in the high potential and semi-arid of Nyeri Country. The results of the study reveal that poor feeding practices damage and greatly affect Alpine dairy goat milk production.

In another study, Rajkuram and Kavitha (2014) conducted research on constraints in goat farming perceived by farm women in the Erode District of Tamil Nadu. The main aim of the study was to assess the constraints perceived by farm women in goat farming in the Erode District of Tamil Nadu. Data of the study were collected from 120 farm women who were sampled randomly using semi-structured interviews. The study used Garrett's ranking technique to assess constraints perceived by farm women. The study reveals that the shrinking of grazing land or lack of grazing land, inadequate availability of breeding buck, lack of veterinary services and middleman were the main constraints.

Study on factors influencing productivity of dairy goats in Laikipia County: a case study of small scale dairy-goat farmers in the Laikipia East District, Kenya (Kinyua, 2011). The main aim of the study was to establish factors influencing productivity of dairy goats among small-scale farmers in the Laikipia East District. The researcher sampled 170 households from 46 groups of smallholder dairy-goat farmers as clusters using proportional random sampling. The researcher used SPSS to analyse primary data.

The results of the study show that level of adoption of breeding technology, disease control, parasite control and lack of market information were the major factors influencing dairy-goat production.

2.5 Marketing Constraints Associated with Marketing of Goat Milk

Surkar *et al.* (2014) conducted study on the constraints perceived by dairy farmers in quality goat-milk production in Taluka. The aim of the study was to evaluate the constraints faced by farmers in producing quality goat milk. Researches collected data from 120 dairy farmers that were randomly selected from 12 villages. The results of the study reveals that unavailability of chilling facilities (Cooling Storage), low price for selling milk, lack of milk testing, lack of the cooperatives communities and financial support were perceived as constraints in producing quality goat milk. Sabapara *et al.* (2014) conducted research on constraints in goat husbandry practices by goat owners in the Navsari District, Gujarat. The main aim of the study was to investigate the main constraints faced by goat owner. Results revealed that the lack of middlemen, feeding, breeding, marketing infrastructure and housing management were the most predominant constraints regarding the marketing and production of goats.

Shinde (2011) conducted research on the socio-economic profile of dairy farmers in the Solapur District of Maharashtra State of India. The study aimed at the utility, economic viability and progress of dairy farming to gauge the improvement in economic conditions of the farmers. The researcher used a stratified sample to probe 260 households of the Maharashtra State. The results indicate that dairy farmers perceive technology, institutional, disease, infrastructure, environment and feed as the main marketing constraints of goat milk.

Research on the milk production from goats for households and small-scale farmers in SA was conducted by Donkin (2011). The main aim of the research was to investigate the feasibility of using goats to produce milk by householders and smallholder farmers in developing areas. The results of this study reveal that specifically crossbred goats have sufficient milk for households and small-scale farmers. The study further indicats that small-scale farmers in developing areas are good keepers of goat milk.

2.6 Factors Influencing Farmer's Decision to Milk Dairy Goat

Farmers in Zimbabwe decided not to milk dairy goat because they did not consume goat milk due to taste and preference. Households prefer cow milk in contrast to goat milk. Educational level and disease control indicated significant level of 5% to stimulate farmer's milking decision. These results were reported by Chamboko *et al.* (2014) on socio-economic factors influencing goat-milk production in the smallholder areas of Zimbabwe: A case study of Bulilima East District. The main aim of the study was to determine the main reasons for keeping goats and to analyse the socio-economic factors influencing goat-milk production in the smallholder areas of Zimbabwe. Researchers used SPSS to analyse the data collected from 40 households selected randomly.

2.7 Possible Solutions to the Above Constraints

Rural-household farmers must attend dairy-goat production trainings to improve their knowledge and skills on goat production. Sufficient knowledge and skills on dairy-goat production will help to overcome the problems of poor feeding and health. Rural-household farmers will get to know the importance of breeding which will then increase their production.

The Limpopo Department of Agriculture (LDA) must link rural household farmers with different agricultural organisations. These organisations will help farmers with all machinery needed to improve and add value on goat milk. Moreover, these organisations can as well find a market for raw and processed goat milk.

Table 2.2: Summary of Strategies to Dairy Goat Production and Goat Milk Marketing Constraints Reported by Umeta *et al.* (2011) Study

Problems	Mitigation strategies used by farmers	Suggested mitigation strategies proposed by the team of researchers
Shortage of feeds	➢ Cutting leaf of large trees and storing crop deposit during feed shortage. ➢ Moving to neighbour place searching for feeds	➢ Advancement of improved Feed varieties and feed preservation ➢ Adoption of agro by-product technology utilization.
Disease	➢ Using home-produced medication or purchasing medication ➢ Washing the affected body with soap and water	➢ Establishment of veterinary centre / services ➢ Identification of main disease in the area
Predator	➢ Shepherding ➢ Construction of burn to protect from hyena and fox ➢ Tying the goat ➢ Selling	➢ Close supervision of the goats ➢ Appropriate housing
Market problems	➢ Searches and approaching markets ➢ Producing goat meeting market requirement ➢ Denying to sell to brokers	➢ Improving of market information ➢ Developing group selling method
Shortage of labour	➢ Reducing flock size to manageable size ➢ Hiring of labour	➢ Enhancing semi intensive production system

Source: (Umeta et al. 2011)

2.8 Summary

Dairy goats are characterized by their breeds. They have the ability to transmit good traits such as high reproductivity, lots of milk production and adaptability to their offspring and through breeding. Goat milk is healthier than other varieties and suitable for human beings facing heath challenges. The composition of goat milk differs from cow and human milk depending on the management, environmental condition etc. Poor feeding, poor breeding, inadequate grazing land, poor processing facilities, absence of middlemen and inappropriate transport facilitators are the major production and marketing constraints faced by rural dairy-goat farmers. It is expected that intervention of LDA and provision of trainings by the state may help to overcome and improve rural households' dairy-goat productions and goat-milk marketing.

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes research methodology followed during the study. It commences by describing the study area from where information on production and marketing constraints of dairy goat was collected; followed by the type of data collected, the methods used to collect data and to analyse the collected data; and lastly, it describes ethical considerations of the study.

3.2 Study Area

The study was conducted in each local municipality of the Sekhukhune District in the Limpopo Province, which is in the most northern part of SA. The district is comprises of five local municipalities, namely, Elias Motsoaledi, Ephraim Mogale, Fetakgomo, Makhuduthamaga and Greater Tubatse. The water services in these areas are provided from its major river called the Olifants River (*Local Government Handbook*, 2015).

Figure 3.1: Sekhukhune District Map (*Local Government Handbook*, 2015)

3.3 Data Collection

The applied method of research design in this study is a case study. The primary data of the study were collected from primary sources mainly rural household dairy-goat farmers through survey using a structured questionnaire (as data collection instrument). Rural household dairy-goat farmers were interviewed using questionnaires. Questions for the interview were both open and closed-ended, based on the respective specific objectives of the study. With open-ended questions, rural household dairy-goat farmers were enabled to state their own opinions, views and experiences in details, while, with closed-ended questions, rural household dairy-goat farmers were restricted to express their full opinions and feelings. The interviews took place at a dairy goat farmers' household which were the unit of analysis.

3.4 Sampling Procedure

Purposive sampling is a type of non-probability sampling that is based on the researcher's practical knowledge or judgments of the study area and representative sample. It is very useful in a situation where the researcher does not know the population of study and it helps to reach the target sample quickly (Palinkas *et al.* 2015).

The study employed purposive sampling in data-collection process. Two villages were selected from the Makhuduthamakga Local Municipality, Fetakgomo Local Municipality, Ephriam Mogale Local Municipality, Greater Tubatse and three villages were selected from the Elias Motsoaledi Local Municipality. Ten rural household dairy-goat farmers were sampled from each selected villages totalling 110 rural household dairy-goat farmers which served as units of analysis for the study. The data were collected from both men and women household farmers.

Table 3.1: Sampled Villages within Sekhukhune District

Sekhukhune District	
Local Municipality	**Villages**
Fetakgomo LM	Ga Matlala (Lepellane) and Malomanye
Greater Tubatse LM	ThokwaneandMoroke
Makhuduthamaga LM	Malegale and Manganeng
EphriamMogale LM	Sevenstad and Moralela
ElliasMotsoaledi LM	Manapsane, Moganyaka and Mamphogo

3.5 Data Analysis

Statistical Package for Social Sciences (SPSS, 2015) computer software was utilised to summarise the primary data collected from Rural Household Dairy-Goat Farmers in the Sekhukhune District into descriptive statistics and presented in the form of frequencies tables, charts and graphs. The Probit Regression Model (PRM) and a Likert scale were used to identify production and marketing constraints of dairy goats and their milk faced by the rural household farmers by establishing relationships between dependent and independent variables. Table 3.2 presents the variables used in the Probit analyses of the study.

Probit Model (PM) is a type of regression where the dependent variable takes two values which are denoted as 1 and 0 (Fernando, 2011). In this study, farmers having production and marketing constraints of dairy goats and their milk were denoted as 1 while those having no production and marketing constraints of dairy goats and their milk were denoted as 0. The level of production and marketing constraints vary among farmers, therefore, a Likert scale of 1 to 8 was employed for farmers to indicate the level of constraint. Sequel to this, the scores of the Likert scale were classified into two groups. The scores from 5 to 8 by a farmer were classified as 1, whilst the scores of $\leq$4 were classified as 0 to form the dependent variable of the Probit Model. The Probit Model is generally specified as below:

General Probit Model: $Y=Pr(Y=1 \mid X) = \Phi(X' \beta)$

Where Pr denotes probability, Φ is the Cumulative Distribution Function (CDF) and β is/are parameter(s). The Probit Model, as a latent variable model with an auxiliary random variable, is expressed as: $Y^* = \beta' X + \varepsilon$,

Where $\varepsilon \sim N(0, 1)$. Then Y can be viewed as an indicator for whether or not this latent variable is positive:

$$Y = \mathbf{1}_{\{Y^*>0\}} = \begin{cases} 1 & \text{if } Y^* > 0 \text{ i.e. } -\varepsilon < X'\beta, \\ 0 & \text{otherwise.} \end{cases}$$

Specifically, the regression model is estimated as:

$$PMC = Yi = \beta_0 + \beta_1 A + \beta_2 G + \beta_3 EdcL + \beta_4 B + \beta_5 FP + \beta_6 GL + \beta_7 OP + \beta_8 TI + \beta_9 SF + \beta_{10} MM + X_{11} LOMI + X_{12} MA + u_i$$

$$Y = \begin{cases} 1 \; If \; Household \; farmer \; have \; production \; and \; marketing \; constraints \\ 0 \; If \; Household \; Farmer \; have \; no \; Production \; and \; Marketing \; constraints \end{cases}$$

Table 3.2: Description of Variables

Variable Code	Name of Variable	Variable Description	Unit of measurement
Dependant variable			
Y = PMC	Production and Marketing Constraints	1 if household farmer has production and marketing constraints; 0 if households farmers are having no constraints.	Dummy
Independent Variables			
X_1 = A	Age	Age of household farmer	Numbers
X_2 = G	Gender	1 = Female; 0 = Male	Dummy
X_3 = EdcL	Education Level	1 if household farmer has tertiary qualification; 0 otherwise	Dummy
X_4 = B	Breeding	1 if household farmer perceives breeding; 0 otherwise	Dummy
X_5 = FP	Feeds Purchase	1 if household farmer perceives poor feeding; 0 otherwise	Dummy
X_6 = GL	Grazing Land	1 if household farmer has grazing land; 0 otherwise	Dummy
X_7 =OP	Own Processor	1 if household farmer has his/her own processor; 0 otherwise	Dummy
X_8 =TI	Transport Infrastructure	1 if household farmer has transport infrastructure; 0 otherwise	Dummy
X_9= SF	Storage Facilities	1 if household farmer has storage facilities; 0 otherwise	Dummy
X_{10} = MM	Middlemen	1 if household farmer has middlemen;0 otherwise	Dummy
X_{11} = LOMI	Lack of Market Information	1 if household farmer has access to market Information; 0 otherwise	Dummy
X_{12}= MA	Market Availability	1 if household farmer has market for milk;0 otherwise	Dummy
μ_i	Error Term	Nil	Nil

3.6 Ethical consideration

Authority to interview household farmers requested from the Limpopo Department of Agriculture in the Sekhukhune District had been granted prior to the data collection process. Respondents were informed about the nature and purpose of the study and participation was voluntary. There was no promise of gifts for participating. All respondents participated in the study per their heart's willingness. Confidentiality of the respondents' information was ensured throughout the study processes. Data collected from household farmers were and are still confidential, and were utilised for the study purpose only. The questionnaires and the captured data will be discarded upon completion of the study.

CHAPTER FOUR
RESULTS

4.1 Introduction

This chapter presents the results of the research study conducted in the Sekhukhune District in the Limpopo Province of South Africa. The chapter consists of three sections, starting with socio-economic characteristics of rural household dairy-goat farmers which is Section A, followed by Section B which outlines factors influencing constraints of dairy-goat production and goat-milk marketing faced by rural household dairy-goat farmers. Section C represents inferential analysis results on the factors influencing production and marketing constraints of dairy goat and goat milk, as well as factors influencing farmer's decision to milk their dairy goat in the study area. The last section, that is Section D, represents possible strategies to overcome production and marketing constraints of dairy goat and goat milk.

SECTION A

4.2 Demographic and Socio-Economics Characteristics of Rural Household Dairy Goat Farmers

4.2.1 Demographic Characteristics of Participants

Table 4.1 overleaf portrays demographic results of rural household dairy-goat farmers in study area. Results of the study indicated that 0.9% of participants were at the age ≤30 years, while 44.5% were aged from 31-50 years. Results further indicated that 46.4% of participants were at age group 51-70 years while 8.2% were aged from 71-90 years. The most likely value of participants were 45 years old. The youngest participant was 30 years while the oldest participant was 90 years old.

The findings of the study depicted that both females (55.5%) and males (44.5%) are participating in rearing dairy goat. Marital status appears to be an important variable, as 33.6% of dairy-goat farmers were single, 41.8% were married and 24.5% of them were widowed. Participants who never attended school were 32.7%, those who attended until primary level were of 13.6%, and secondary were of 35.5% and 18.2% of participants attended tertiary level education.

The results further revealed that 16.4% of dairy-goat farmers receive monthly income from salary whereas others receive from farming (1.8%), social grants (45.5%), pension (7.3%) and 29.1% is from other source of income.

Table 4.1: Demographic Characteristics of Participants

Variables			
	Mode	45 years	
	Minimum	90 years	
	Maximum	30 years	
Age	**Ranges**	**Frequency**	**Percentage**
	Less than 30 years	1	0.9%
	31-50 years	49	44.5%
	51-70 years	51	46.4%
	71-90 years	9	8.2%
Gender	Female	61	55.5%
	Male	49	44.5%
Marital status	Single	37	33.6%
	Married	46	41.8%
	Widowed	27	24.5%
Educational level	No Schooling	36	32.7%
	Primary	15	13.6%
	Secondary	39	35.5%
	Tertiary	20	18.2%
Source of income	Salary	18	16.4%
	Farming	2	1.8%
	Social Grant	50	45.5%
	Pension	8	7.3%
	Other	32	29.1%

4.2.2 Socio-Economics Characteristics of Participants

Results of the socio-economic characteristics are represented in the Figure 4.1 and Table 4.2, respectively. The results show that 60% of the participants keep less than five dairy goats; among them the majority keeps four dairy goats (Table 4.2). Other participants keep between 6-15 dairy goats (36.4%), and another group keeps between 16-25 dairy goats (7%) and only 1% of participants are keeping 26-40 dairy goats. The smallest number of dairy goat kept was 1 while the highest number was 40 dairy goats (Table 4.2).

Furthermore, results indicate that 96.4% of participants are having one kraal while 3.6% have two kraals. 75.5% of the participants never fed their dairy goats, but 10.9% fed their dairy goats once per day and 13.6% fed them twice per day.

Table 4.2: Socio-Economic Characteristics of Participants

Variable			
Number of dairy goat	Mode	4	
	Maximum	40	
	Minimum	1	
	Range	**Frequency**	**Percentage**
Number of kraal	One	106	96.4%
	Two	4	3.6%
	Never	83	75.5%
Feeding times	Once	12	10.9%
	Twice	15	13.6%

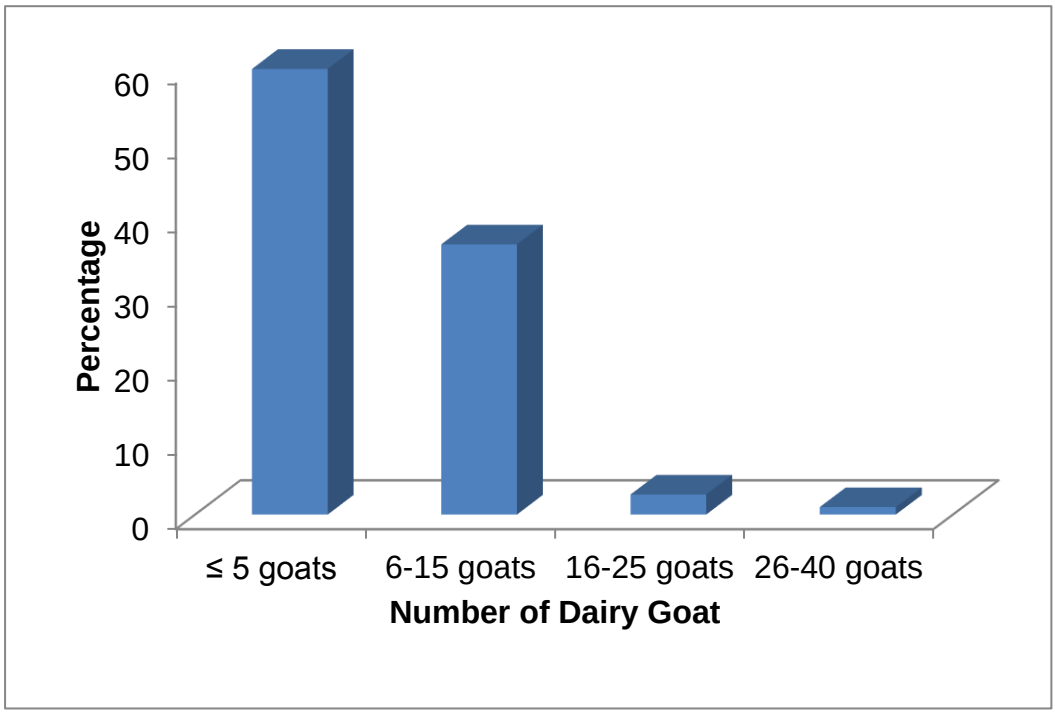

Figure 4.1: Number of Dairy Goat Kept by Rural Household Farmers

SECTION B

4.3 Production and Marketing Constraints of Dairy Goat and Goat Milk Faced by Goat Farmers in Sekhukhune District of Limpopo Province

4.3.1 Production Constraints of Dairy Goats

Table 4.3 present factors influencing production constraints of dairy goats. Rural household dairy-goat farmers who are facing dairy-goat production constraints were counted at 64.5% while 35.5% are facing no constraints. Feeds purchase for dairy goat was done by one group of participants (23.6%), whereas the rest of participants (76.4%) does not buy dairy-goats feeds. 16.4% of the dairy-goat farmers in the study area indicated that they could afford the market price of dairy goats' feeds while others (at 83.6%) do not afford. 13.6% reported that feeds are never available in the market; some (at 32.7%) indicated that feeds are sometimes available and the last group (at 53.6%) indicated that feeds are always available in the nearest market depending on the location.

Further, the results show that 48.2% of participants stated that dairy goats are protected against predators and thieves while 51.8% reported that dairy goat are not safe. The findings further indicate that cleanliness of dairy the goats' kraal remains a challenge (54.5%) in the study area, while the other group of participants (45.5%) stated that cleanliness of the kraal is not an issue at all. Veterinary service of dairy goats in the study area was accessed by few groups of dairy-goat farmers (14.5%), whereas the majority of dairy-goat farmers (at 85.5%) complains that they never receive any veterinary health service for their dairy goats. Breeding is done by few farmers (at 1.8%) and the rest never breeds their dairy goats (at 98. 2%). Grazing land appears not to be a challenge to the majority of participants (at 93.6%) but a challenge to few farmers (at 6.4%).

Table 4.3 Production Constraints of Dairy Goat in Sekhukhune District of Limpopo Province

Variable	Range	Frequency	Percentage
Dairy goat production constraints	Yes	71	64.5%
	No	39	35.5%
Feeds purchase	**Yes**	**26**	**23.6%**
	No	**84**	**76.4%**
Feeds Affordability	Yes	18	16.4%
	No	92	83.6%
Feeds shortage	**Not available**	**15**	**13.6%**
	Sometimes	**36**	**32.7%**
	Always	**59**	**53.6%**
Safety	Safe	53	48.2%
	Not safe	57	51.8%
Cleanliness	**Yes**	**50**	**45.5%**
	No	**60**	**54.5%**
Veterinary health service	Yes	16	14.5%
	No	94	85.5%
Breeding	**Yes**	**2**	**1.8%**
	No	**108**	**98.2%**
Grazing land	Yes	103	93.6%
	No	7	6.4%

4.3.2 Marketing Constraints of Goat Milk in Sekhukhune District of Limpopo Province

Results of the factors influencing marketing constraints of goat milk are presented in Table 4.4. The results reveal that 34.5% of participants indicated that they milk their dairy goats. These results emphasise that marketing constraints of goat milk are faced by the group of farmers that decided to milk their goats (34.5%). Many participants do not milk their dairy goats (65.5%). Dairy-goat farmers (34.5%) reported that they use the traditional method to milk their goat. They further reported that they use the boiling method to processes goat milk (31.8%), whereas others do not process goat milk at all (68.2%). Refrigerators were used to store goat milk (at 52.7%), however, storage facility remains a challenge to the rest of the group (at 47.3%). All dairy-goat farmers (100%) in the study area reported that market information, market availability, middlemen and transport facility remain major marketing problems of goat milk.

Table 4.4 Marketing Constraints of Goat Milk in Sekhukhune District of Limpopo Province

Variables	Range	Frequency	Percentage
Goat milk marketing	Yes	38	34.5%
	No	72	65.5%
Milking decision	**Yes**	**38**	**34.5%**
	No	**72**	**65.5%**
Milking techniques	Traditional use: hand	38	34.5%
	Not milking	72	65.5%
Processing (boiling)	**Yes**	**35**	**31.8%**
	No	**75**	**68.2%**
Storage facility (refrigeration)	Yes	58	52.7%
	No	52	47.3%
Market information	**Yes**	**0**	**0%**
	No	**110**	**100%**
Market availability	Yes	0	0%
	No	110	100%
Middlemen	**Yes**	**0**	**0%**
	No	**110**	**100%**
Transport facility	Yes	0	0%
	No	110	100%

SECTION C

4.4 Inferential Analysis Results on the Factors Influencing Production and Marketing Constraints of Dairy Goat and Goat Milk as Well as Factors Influencing Farmer's Decision to Milk Their Dairy Goat in the Study Area

4.4.1 Probit Model Results: Factors Influencing Production Constraints of Dairy Goat

Table 4.5 presents the results of the Probit Model Multiple Regression Analysis factors influencing production constraints of dairy goat. The model summary of the results shows a very significant Chi-square at 5%, which is an indication of acceptable goodness-of-fit of the model. The results showed that veterinary health service (ε. -0.533; 0.071), safety (ε. 0.232; 0.025) and grazing land (ε. 0.797; 0.031) are significant variables and they have influence on dairy-goat production.

Table 4.5: Parameter Estimates of Probit Analyses of Factors Influencing Production Constraints of Dairy-Goat Farmers

Parameter	Estimate	Std. Error	Z	Sig	95% Confidence interval	
					Lower Bound	Upper Bound
Age	.001	.003	.055	.956	-.007	.007
Gender	.049	.099	.490	.624	-.146	.243
Number of Dairy Goats	-.004	.011	-.318	.751	-.026	.019
Feeds purchase	-.147	.135	-1.088	.277	-.412	.118
Veterinary Health Service	-.533	.295	-1.806	.071	-1.112	.046
Safety	.232	.103	2.244	.025	.029	.435
Grazing Land	.797	.369	2.162	.031	.075	1.520
Breeding	-2.22	436.033	-.005	.996	-856.830	852.389
Cleanliness	-.064	.103	-.621	.534	-.266	.138
Intercept	-3.390	.465	-7.284	.000	-3.855	-2.924
Chi-Square test	**Chi-Square**		**Df**			**Sig**
Pearson goodness-of-fit test	136.489		100			.009

4.4.2 Probit Model Results: Factors Influencing Marketing Constraints of Dairy Goat

Results of the Probit Model Multiple Regression analysis showing factors influencing marketing constraints are represented in Table 4.6. The results indicate a very

significant Chi-square at 5%. This is an indication of acceptable goodness-of-fit of the model. The results displayed that gender (ε. -0.356; sig.0.021), breeding (ε. 2.561; sig 0.000) and processing (ε. 2.342; sig 0.000) are significant variables and they have influence in marketing of goat milk.

Table 4.6: Parameter Estimates of Probit Analysis of Factors Influencing Marketing Constraints of Goat Milk Farmers

Parameter	Estimate	Std. Error	Z	Sig.	95% Confidence Interval Lower Bound	Upper Bound
Age	.006	.006	.956	.339	-.006	.018
Gender	-.356	.155	-2.303	.021	-.659	-.053
Number of dairy goats	-.012	.014	-.870	.384	-.038	.015
Veterinary Health service	.171	.226	.753	.451	-.273	.614
Breeding	2.561	.701	3.652	.000	1.186	3.935
Cleanliness	.081	.154	.523	.601	-.222	.383
Processing	2.342	.552	4.240	.000	1.259	3.424
Storage facility	-.289	.189	-1.527	.127	-.660	.082
Intercept	-4.466	.617	-7.236	.000	-5.084	-3.849

Chi-Square Tests	**Chi-Square**	**Df**	**Sig.**
Pearson Goodness-of-Fit Test	5305.805	101	.000

4.4.3 Probit Model Results: Factors Influencing Farmer's Decision to Milk Their Dairy Goat

The results displayed in Table 4.7 are of the analysis of factors influencing farmer's decision to milk dairy goats. Chi-square at 5% indicate that there is an extreme significance, which indicates the acceptable goodness-of-fit of the model. The results showed that breeding (ε. 1.540; sig 0.052), processing (ε. 3.344; sig 0.000) and grazing land (ε. 2.975; sig 0.005) are significant variables and have either positive or negative influences on a farmer's decision to milk dairy goats.

Table 4.7: Parameter Estimates of ProbitAnalyses of Factors Influencing Farmers' Decision to Milk Dairy Goat in the Study Area

Parameter	Estimate	Std. Error	Z	Sig.	95% Confidence Interval Lower Bound	Upper Bound
Age	.005	.006	.815	.415	-.007	.018
Gender	-.259	.168	-1.540	.124	-.588	.071
Number of dairy goats	.006	.012	.482	.630	-.017	.028
Veterinary Health service	.344	.241	1.424	.154	-.129	.817
Breeding	1.540	.791	1.947	.052	-.010	3.091
Cleanliness	.159	.178	.895	.371	-.189	.507
Processing	3.344	.620	5.392	.000	2.129	4.560
Storage facility	-.184	.220	-.837	.403	-.616	.247
Safety	.052	.173	.298	.765	-.288	.391
Grazing land	2.975	1.049	2.836	.005	.919	5.031
Feeds purchase	-.124	.185	-.669	.503	-.485	.238
Intercept	-8.761	1.266	-6.919	.000	-10.027	-7.495
Chi-Square test	**Chi-Square**	**df**			**Sig.**	
Pearson goodness-of-fit test	2057823	.36398			.000	

SECTION D

4.5 Possible Strategies to Overcome Production and Marketing Constrains of Dairy Goat and Goat Milk

The possible strategies to overcome production and marketing constraints of dairy goat and goat milk in the study area are represented in Figure 4.2 below. Rural household dairy goat farmers suggested dairy goat cooperatives (45.5%), government intervention (85.4%), provision of veterinary health service (26%), and agricultural trainings and workshops (7%) as possible solutions to solve challenges faced by them in running dairy-goat production and goat-milk marketing.

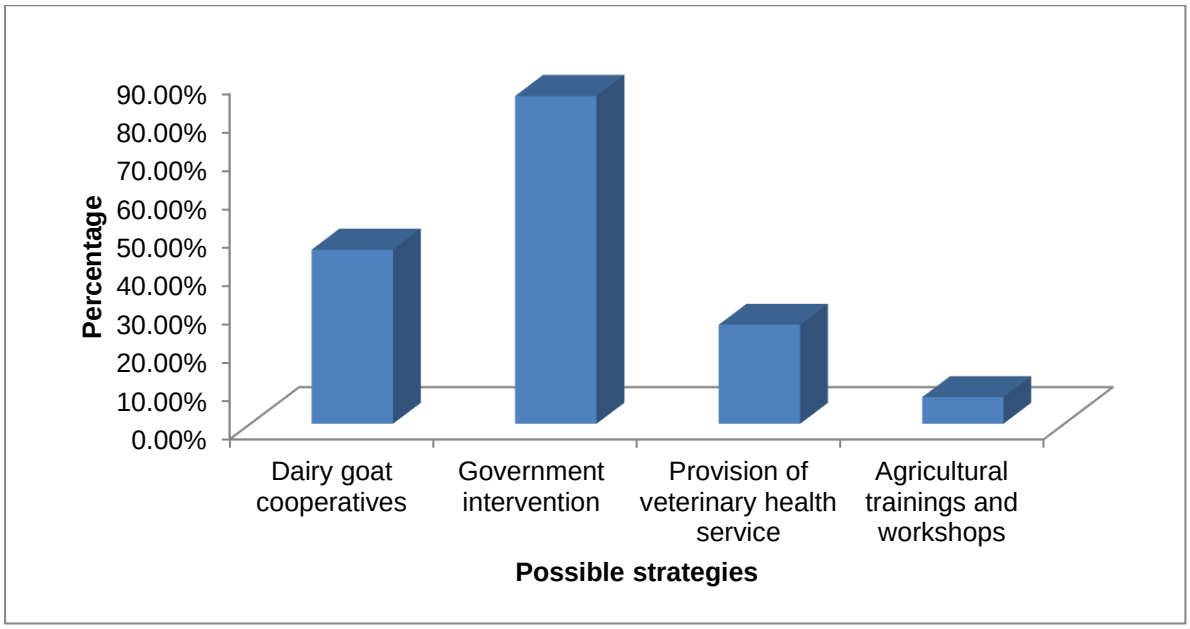

Figure 4.2: Possible Strategies to overcome Constraints of Production and Marketing of Dairy Goat and Goat Milk

CHAPTER FIVE
DISCUSSION

5. Introduction

This chapter gives a detailed discussion of the study results, focusing on the demographic characteristics and socio-economic characteristics of the participants, the factors influencing constraints of dairy-goat production and goat-milk marketing faced by rural household dairy-goat farmers, regression analysis of factors influencing production and marketing constraints of dairy goat and goat milk, factors influencing farmer's decision to milk their dairy goat as well as possible strategies to overcome production and marketing constraints of dairy goat and goat milk.

SECTION A

5.1 Demographic Characteristics of Participants

Results of the study indicated that 46.4% of participants were of the age group 51-70 years. This depicts that dairy-goat production and goat-milk marketing is an activity of adults and is hardly practised by the youth in the rural areas of the Sekhukhune District. Similar results have been reported by Kinyua (2011). This author suggested that goat keeping is an aging activity and is rarely practised by youths.

Based on the results of the present study dairy goat production and marketing of goat milk in the Sekhukhune District is practised by both female and male, however, the slightly dominating group of farmers were the female ones at 55.5%. These results were unexpected as it was stereotyped that dairy-goat production and goat-milk marketing was a duty of males, more especially in rural areas like the Sekhukhune District. These findings are different from the findings of Tesfaye and Tamir (2015) who reported that men, instead of women, engaged in most of goat-marketing operations in Ethiopia such as purchase and sale, as well as breeding-related decisions, while women play an important role of caring for sick animals and milking of dairy goats. Similarly, these findings are contrary to the findings of Yusoff *et al.* (2016) who observed that men are more likely to be engaged in small ruminant farming than women. The reason for this gender inequality in dairy-goat farming among the participants in the study area is not known. However, it is possible that, because

women are responsible for food availability in their households, they hence engage more in dairy-goat production and goat-milk marketing in order to raise money for food in their households.

In this present study, 41.8% of the participants producing dairy-goat milk indicated that they were married. This result was expected in the study area since dairy-goat production and goat-milk marketing is an activity that requires effort or supporting system from both husband and wife. Sagwe (2012) found similar results in the Borabu District, Nyamira Country, Kenya, and suggests that marital status has influence on the commercialization programme of goat milk marketing.

Educational level had got an influence on both dairy-goat production and goat-milk marketing, hence, the results indicate that only 18.2% of participants attended tertiary level education. This is different from the findings of Sagwe (2012) and Byaruhanga *et al*. (2012) who reported that literacy levels are expected to be high to enhance goat production and market participation. Thus, as suggested by the authors, literate farmers are more likely to adopt and practise new technologies that will enhance dairy-goat productivity and market participation. The reason for this low literacy levels in the study area might be supported by the fact that the most of participants in the study were adults; with 45.5% of participants reporting that they rely on Social Grants as source of monthly income, which was inadequate for tertiary fees payment and provision of household necessities.

Sources of income reported by the participants include 16.4%, receivers of monthly income from salary, 1.8% of monthly income from dairy-goat farming, 7.3% of monthly income from pension and 29.1% receive monthly income from other sources such as remittances, gifts and donations. This result clearly shows that dairy-goat farming plays a limited or small role as an income contribution of rural households who participated in the study. It might be an indication that people in rural areas of the Sekhukhune District of Limpopo Province tend to neglect dairy-goat farming and its positive impact on livelihood of households. These findings are, however, in disagreement with the findings of Byaruhanga *et al*. (2012) who reported that 92.1% of household farmers in Uganda ranked goat farming as their first livelihood activity.

5.2 Socio-Economic Characteristics of Participants

The majority of participants (60%) in the present study reported that they keep less than five dairy goats (the mode of the distribution is four dairy goats). Shinde (2011) conducted a study on the socio-economic profile of dairy farmers in the Solapur District of Maharashtra State of India to examine the overall condition of dairy farmers and welfare of rural households. The findings by Shinde (2011) reveal that 70% of rural households keep one to three dairy goats. The 70% reported by Shinde (2011) is slightly higher than the 60% reported in the present study. However, both findings confirm the fact that the majority of rural households keep less than five dairy goats. Other participants keep between 6-15 dairy goats as reported by 36.4% of the participants; 16-25 dairy goats as reported by 7% of the participants; and only 1% of participants keeps 26-40 dairy goats. The fact that only 1% of participants keeps about 26-40 dairy goat was very unimpressive, inadequate and highly unexpected since dairy goats farming is very familiar in most rural areas of the Sekhukhune District. The reason for this low percentage is not known, although the majority of participants complained of wildlife predators and theft as threats to their dairy-goat farming enterprise.

Belete *et al*. (2015) suggest that a good kraal is required to fulfil shelter rights of livestock and to protect livestock from extreme temperature, predators and theft, to make management easier and to provide opportunities for intensive feeding and natural breeding (mating). In the present study, 96.4% of the participants keep their dairy goat in one kraal. This result was, however, inadequate and unexpected as it was thought that kraals are expected to be two for all farmers in order to make management easier as suggested by Belete *et al*. (2015). In this instance, one kraal will accommodate young goats (kids) and the other one will accommodate adult goats such as bucks and doe, as well as fulfilling the shelter rights of animals. However, only a limited number of about 3.6% of the participants seems to fulfil this requirement as they stated that they have two kraals to keep dairy goats (bucks and doe) and their kids. This is highly inadequate and should be addressed with the assistance of the extension officers.

Participants who never fed their dairy goats were 75.5%, while 10.9% of participants reported that they fed their dairy goats once per day. These results were unexpected

as dairy goats are expected to receive feeds at least twice a day for improved productivity as suggested by Mosoma (2009). Perhaps possible reasons for not feeding their dairy goat could be ascribed to feeds shortage as reported by more than half of participants (53.6%) and high cost of feed as reported by 83.6% of participants in the study area. Although in support of the findings by Mosoma (2009), a limited number of participants (at 13.6%) indicated that they fed their dairy goats twice per day; once in the morning before dairy goats leave the kraal and once in the afternoon.

SECTION B

5.3 Production Constraints of Dairy Goat in Sekhukhune District of Limpopo Province

Goat production significantly benefits dairy-goat farmers as they can be used for home consumption purpose, for example, milk products. In addition, goat was also used as major source of cash income, production of meat and insurance for crop production in rural areas. In the present study, participants were asked to indicate constraints of dairy-goat production faced by dairy-goat farmers in the study area. A Likert scale from 1 to 8 was used to determine production constraints experienced by dairy-goat farmers in the study area, where 5 to 8 denoted as 1 or production constraints.

Production constraints of dairy-goat enterprise were experienced by the majority of the participants as indicated by 64.5% of participants. These findings might suggest that there is a gap of improvement that is still required in running dairy-goat production in the rural areas of the Sekhukhune District. Although the reason for this huge number of participants facing dairy-goat production constraints is not known, however, it might be attributed to the low level of literacy among participants as previously indicated. The low level of literacy limits knowledge and skills required in running dairy-goat production, hence farmers are reluctant to adopt new technologies, for example, modern breeding methods to improve productivity. On the other hand, only 35.5% reported that they are not facing any constraints in running their dairy-goat production. This number is very low and needs to be improved upon possibly with the assistance and intervention of extension officers.

In addition, 76.4% of the participants reported that they do not buy feeds for dairy goat, while 83.6% of participants indicated that they failed to buy feeds because of the high cost of dairy feeds. This result was expected and it is a true reflection of the economic situation among the participants in the study area, since the majority of the farmers only receive income from Social Grants. Often, income from Social Grants are used for the purchase of family groceries, with little or none left for the purchase of dairy-goat feed, hence limiting their purchasing power. Similar findings were also reported by several other researchers (Kaur *et al*. 2011, Sonpasare *et al*. 2011 and Bulbul *et al*. 2015). These authors found that the high cost of concentrates (green fodder) is a major limitation to feeds purchase of dairy goats' feeds.

Furthermore, the results also indicate that feeds shortage was not a serious limitation to dairy-goat faming in the rural area of the Sekhukhune District as more than half of participants (at 53.6%) reported that supplementary feeds such as grasses, tree leaves, Lucerne etc., of dairy goat are always available in the nearest market. This finding is supported by the findings of Mosoma (2009) who also indicated that dairy goats can be fed different supplementary feeds such as grasses or Lucerne, legumes, tree leave and fresh kitchen remains. Moreover, Mohammed *et al.* (2016) suggest that natural pasture, roadside grazing, crop aftermath, crop residue and wild fodder were major resources of dairy-goat feeds. However, contrary to the present findings, Gebrekiros (2014) reported that feeds shortage is the major problem faced by goat farmers in rural areas of Tigray, Ethiopia.

More than half of the participants (at 51.8%) reported that the safety of dairy goats remains the major challenge in running their dairy-goat production enterprise because wildlife predators and thefts were threats to their livestock. These results were not surprising as the majority of the participants allowed their dairy goats to scavenge and feed on the natural pastures without herders. Similar results were also found by Jana *et al.* (2014) who report that complaints by neighbours and attack by predators were the major safety issues faced by farmers in their goat-production enterprise.

Cleanliness and veterinary health service seem to be significant factors contributing to health variable of dairy goats. The findings of these study show that cleanliness of dairy goats' kraal remains a limitation to dairy-goat production (54.5%). Similar findings have also been reported by Mrema and Rannobe (2014) who observed that a dirty kraal will cause outbreak of diseases during wet seasons, resulting in death and the concomitant loss of the dairy goats. However, 45.5% of participants reported that cleanliness of kraal is not a limitation to their dairy-goat production.

In addition, the result also reveals that the veterinary health service of dairy goats in the study area was accessed by few of dairy-goat farmers (14.5%), whereas the majority of them complained that they never received any veterinary health service (85.5%). Participants without access to veterinary health service indicated that this predisposes their animals to diseases and health challenges. Amulen (2012) supports the above statement that major constraints in running dairy-goat production are goat

diseases and limited access to water among farmers. Furthermore, Gebrekiros (2014) also observes that inadequate veterinary services are the major cause of livestock disease and have a restricting effect on the productivity of livestock.

According to the findings of the present study, breeding was given little attention by the farmers. Almost all participants indicated that they never breed their dairy goats. This was reported by 98.2% of respondents in the rural area of the Sekhukhune District. It is important to emphasise that lack of adoption of proper breeding procedure is a major constraint in dairy-goat enterprise as it often results in a population bottleneck, thus leading to a scarcity of pure breeds. Similar results have been reported by Jana *et al.* (2014) who observed that lack of pure-breed buck was found to be the most serious constraint ranked by farmers in the Burdwan District of West Bengal.

Access to grazing land was reported by 93.6% of the participants. This is very impressive and highly commendable bearing in mind that grazing land remains the most influential production constraint to the dairy-goat enterprise. This is the main source of natural pastures (e.g. grasses) on which most of the dairy goats rely for feeds. However, this result was inconsistent with the findings by Amulen (2012). In his studies in Uganda, this author observed that access to grazing land in terms of hectares was on a decreasing drift and negatively influencing goat production. However, 6.4 % of the participants reported that they do not have access to grazing land. This is insignificant and might be attributed to urban encroachment.

5.4 Marketing Constrains of Goat Milk Sales in Sekhukhune District of Limpopo Province

Rural household dairy-goat farmers in the Sekhukhune District were asked to indicate the marketing constraints they faced when attempting sales of goat milk. A Likert scale 1 to 8 was used to determine marketing constraints experienced by dairy-goat farmers in the study area, where 5 to 8 was denoted as 1 or marketing constraints.

The results showed that 65.5% of dairy-goat farmers in the present study are not experiencing marketing constraints of goat milk. This result is expected because, essentially, these farmers also indicated that they do not milk their goats because they do not consume goat milk. Similar findings have been reported in Zimbabwe by

Chamboko *et al*. (2014) who observed that households do not milk dairy goats because they do not consume goat milk. On the other hand, 34.5% of participants who regularly milk their goats indicated that they experience goat-milk marketing challenges. This result is not surprising since there is no formal organised goat-milk sales market in the Sekhukhune District. Often, sales of goat milk are conducted through auctions or word of mouth whereby locals are referred to the sellers only when the need arises.

Milking techniques also appear to be a critical factor constraining marketing of goat milk in the study area. Participants (34.5%) in the present study reported that they use traditional method such as hands to milk their dairy goats. Perhaps the possible explanation for the use of the traditional method in goat milking might be the fact that rural household dairy-goat farmers in the study area are not exposed to effective and efficient technologies that can best be used to enhance milking of high quantities of goat milk. In support of these findings, Yangilar (2013) reports and emphasizes that it is not milking techniques only that have an influence on goat-milk marketing, but that the poor conditions in which goats are milked under the traditional method can also effectively influence marketing of goat milk.

Goat-milk processing and storage facilities were among the marketing constraints reported by farmers in the Sekhukhune District. Rural household dairy-goat farmers in the study area indicated that they cook goat milk before consumption (31.8%), whereas 68.2% of participants consume raw milk. The fact that more than half of participants consume unprocessed milk was highly worrisome because it was thought that goat milk needs to be cooked or processed before consumption to kill naturally occurring bacteria that can cause diseases. Similar results were also found by Surkar *et al*. (2014) in the Taluka District, India.

In the present study, results revealed that 100% of dairy-goat farmers in the study area do not have access to market information and market place to sell their goat milk. Consistent with the present findings, Kinyua (2011) reports that the majority of households in Kenya does not have market information on where to sell their goat products. The results further reveal that 100% of the participants do not have middlemen to market their goat milk. However, in contrast, Kipserem *et al*. (2013) in

their studies in Kenya observed that there is always an existing local market at which dairy goat farmers in the rural areas can sell their goat milk.

Transport facility was also a common challenge reported by farmers in the present study. There is no existing transport facility for the distribution of goat milk to the customers and market places as reported by 100% of the participants. This could be attributed to the poor road infrastructure and the usage of gravel road in the rural areas of the Sekhukhune District. Similar results were also found by Bultossa (2016) in Ethiopia who observed that unimproved roads and transport facility influence marketing participation of small dairy farmers.

SECTION C

5.5 Inferential Analysis of Factors Influencing the Production Constraints of Dairy Goat in the Study Area Using the Probit Regression Model

The Probit Regression Model was used to analyse determinants of production constraints of dairy goat in the study area. The model summary of the results has a statistically significant Chi-square at 5% significance level, an indication of acceptable goodness-of-fit of the model. Out of the nine independent variables used, three were found to have statistically significant influence on the production constraints of dairy goat.

In the present study, results indicate that the coefficient estimate associated with the access to veterinary health services by dairy-goat farmers was negative (-0.533) and statistically significant at 10% level of significance (sig 0.071). Thus indicating that a unit increase in the availability and access to veterinary health services will decrease production constraints of the goat dairy, with all other factors held constant. This result is impressive and convincing since availability and access to veterinary health services will reduce dairy-goat diseases constraining production in the area, and will ultimately enhance productivity of dairy goat. A study by Mohapatra *et al*. (2012) has also confirmed that lack of veterinary facilities was an important constraint to dairy farming.

Additionally, results of inferential analysis also indicate that the safety of dairy goats has a positive and statistically significant effect on the production constraints of dairy goat. Thus it means that every unit increase in the safety of dairy goat will increase production constraints of dairy goat with all other factors held constant. Essentially, the purpose of improved safety is to create production enterprises that have built-in defence mechanisms against things that normally threaten animals, such as predators and diseases. While this defence mechanism is created with improved safety, it is expected that the number of animals will increase with its concomitant effect on production management interventions such as increased requirement of veterinary services, increased requirement of feed availability, and increased feed shortages. These increased requirements in most cases are often beyond a farmers' control and might become a barrier to improved productivity and as such constraining production. No other study was found in the literature on this issue, safe that of Majbrit (2015) who

supports the findings that adequate housing is the major principle enhancing safety of dairy goat in running dairy-goat production.

Grazing land was also among the factors influencing production constraints of dairy goats. The coefficient estimate associated with grazing land of dairy goat by dairy-goat farmers was positive (at 0.797) and statistically significant at a 5% level of significance (sig 0.031), thus indicating that a unit increase in the grazing land of dairy goats will increase production constraints of the dairy goat with all other factors held constant. Rajkuram and Kavitha (2014), however, found different results. These authors observed that the shrinking of grazing land or lack of grazing land, which was ranked first by participants in the Erode District of Tamil Nadu, appears to be the most important cause of increased production constraint to dairy-goat production. This result was nevertheless unexpected as it was thought that grazing land will provide abundant feeds from natural pastures and will help to enhance dairy-goat productivity. However, a possible explanation for the increase of production constraints as the result of unit increase in grazing land might be the fact that abundant grazing land will require herders to take care of dairy-goat livestock against thieves and predators. Herding comes with increased cost of protection and safety, and ultimately increases production constraints.

5.6 Inferential Analysis of Factors Influencing the Marketing Constraints of Goat Milk in the Study Area Using the Probit Regression Model

The Probit Regression Model was used to analyse determinants of marketing constraints of goat milk in the study area. The results of the study show a model summary of significant Chi-square at 5% level of significance, which is an indication of acceptable goodness-of-fit of the model. Out of the eight independent variables used, three were found to have statistically significant influence on the marketing constraints of goat milk in the study area.

The coefficient estimate associated with the gender of farmers was negative (at -0.356) and statistically significant at 5% level of significance (sig 0.021); thus indicating that being a female farmer (which was coded as 1) will decrease marketing constraints of the goat milk, with all other factors held constant. This may be due to the fact that women who milk their goats do so with the sole purpose of household consumption,

rather than sales, leading to this tends to reduce or decrease the marketing constraints. FAO (2017) reported similar findings that, in developing countries, rural women take the responsibility of growing and preparing food consumed in the home, while raising small livestock and carrying out home food processing to minimize cost of production.

Furthermore, the results of inferential analysis indicates that the breeding of dairy goats has a positive and statistically significant effect on the marketing constraints of goat milk. This means that every unit increase in the breeding of dairy goat will increase marketing constraints of goat milk with all other factors held constant. Hence, that is expected that the main reason for an increase in marketing constraints of goat milk is the fact that breeding will result in higher production of dairy goats, with possible increased milking activity. Mrema and Rannobe (2014) observe that a large numbers of animals kept leads to overproduction, which results in inadequate feeds and poor market participation as consequences of inadequate milking instruments.

Processing was another factor influencing marketing constraints of goat milk. The results of inferential analysis indicates that the processing of goat milk has a positive and statistical significant effect on the marketing constraints of goat milk. This means that every unit increase in the processing of goat milk will increase marketing constraints of goat milk with all other factors held constant. Consequently, this result was expected and convincing as it is a known fact that the processing of goat milk enhances milk quality with long shelf-life span although there will be an attendant increased cost of production. This increased cost therefore makes processed goat milk to be more expensive to the consumers and end up not being purchased, thereby increasingly constraining goat-milk marketing due to low patronage (International Dairy Federation, 2012). In addition, Zereu *et al*. (2016) indicate that household farmers did not consume milk due to different cultures, lack of awareness of the importance of goat milk and low amount of milk produced by goats. Poor conditions in which goat milk is processed and poorly manufactured milk were also observed as the origin of marketing constraints (Yangilar, 2013).

5.7 Inferential Analysis of Factors Influencing Farmers' Decision to Milk Dairy Goat in the Study Area Using the Probit Regression Model

The Probit Regression Model was used to identify factors influencing farmers' decision to milk dairy goat in the study area. The model summary of the results indicated a very significant Chi-square at 5% level of significance, which is an indication of acceptable goodness-of-fit of the model. Out of the eleven independent variables used, three were found to have statistically significant influence on the farmers' decision to milk dairy goat in the study area.

Among the three significant variables was breeding. The coefficient estimate associated with breeding of dairy goat was positive (at 1.540) and statistically significant at 5% level of significance (sig. 0.052); thus indicating that a unit increase in the breeding of dairy goats will increase farmers' decision to milk dairy goat with all other factors held constant. A possible explanation for this finding is that increase in breeding will improve milk production in goats and ultimately will trigger dairy-goat interest as well as the willingness to milk their goat (Pambu, 2012).

Processing was another factor influencing farmers' decision to milk dairy goats. The coefficient estimate associated with processing of goat milk was positive (at 3.344) and statistically significant at 5% level of significance (sig. 0.000), thus indicating that a unit increase in the goat-milk processing will increase farmers' decision to milk dairy goat with all other factors held constant. This finding is, however, expected since a unit increase in goat milk processing will add value on milk by increasing the shelf life of the product and ultimately resulting in enhanced income from sales and thereby accelerating the farmer's willingness to milk their dairy goats. To support this finding, the Department of Agriculture, Forestry and Fisheries (2016) reported an increasing trend of goat-milk production in South Africa which leads to improvement in the livelihood of the farmers in the country.

The coefficient estimate associated with grazing land of dairy goat was also positive (at 2.975) and statistically significant at 5% level of significance (sig 0.005), thus indicating that a unit increase in the grazing land of dairy goat will increase farmer's decision to milk dairy goats with all other factors held constant. This result is possible given the fact that the availability of grazing land will provide enough natural feeds for

dairy goats (*Pasture for Life*, 2016) and enable them to produce enough milk for their offspring, farmers' family consumption, as well as for sales. This condition will help to accelerate the farmers' willingness to milk their goats with all other factors held constant.

SECTION D

5.8 The Possible Strategies to Reduce Constraints to Efficient Production and Marketing of Goats and Goat Milk by Rural Household Dairy-Goats Farmers in Sekhukhune District

Dairy Goat Cooperatives

Dairy goat cooperatives are defined as group of farmers gathered to rear their dairy goat herds through which, farmers will share resources, risks and farming benefits. It is important for farmers cooperatives to succeed and to be sustainable, while there are increasing probabilities of financial and non-financial support from both government and other farming organisation (Bakengesa, 2011).

The most of rural household dairy-goat farmers (45.5%) in the study area reported that the government should help them have access to services of an extension officer to aid in gathering dairy-goat farmers together and form rural household dairy-goat farmer's cooperatives through which they will construct dairy-goat camps to accommodate the entire dairy-goat herds. Participants supported this strategy by indicating that dairy-goat camps will help to get rid of predators and thieves, as well as reduce some cost of production, for example, unnecessary labour cost incurred by hiring goat herder. This view is supported by the findings of Umeta *et al*. (2011) who report that proper housing is the major mitigation strategy towards predators and thieves.

Government Intervention

The government plays an important role in all economics activities, and this also covers agricultural activities. Miloje *et al.* (2014) indicate that government intervention in the agricultural sector will enhance efficiency of agricultural production, protection of farmers' income, food safety and food security. This study further reported that the role of the government is available for both informal and formal agricultural activities.

Market availability, access to market information, middlemen and transport facility appears to be a major marketing problem in the study area. 100% of the rural household dairy-goat farmers in the study area are facing this problem. The majority of the participants (at 85.4%) suggested that the Limpopo Department of Agriculture

should help them to mitigate against these challenges by linking them to available goat-milk markets or help them to create their own markets as cooperatives. They emphasized that this can be achieved through a well-coordinated government intervention programme in the area. The World Food Programme (2015) supports the farmers' suggestion that sustainable markets for quality produced goat milk will enable farmers to negotiate for a better price for their goat milk and overcome inequality of income distribution at the household level.

Provision of Veterinary Health Service

Access to veterinary service plays an important role in the health of livestock. However, government veterinary service policies or programmes exclude goat livestock from the programme in the study area. Some of the dairy-goat farmers who are keeping both cows and goats in their farms indicated that they receive veterinary service for cows only. In this regard, 26% of the dairy-goat farmers in the study area therefore suggested that the government should revisit its policies and provide veterinary service to both goats and cows. Similar suggestions have been made by Chamboko *et al*. (2014) who reported that the government can purposely formulate strategies to introduce improved goat milk breeds and promote the development of para-veterinary programmes to support dairy-goat and goat-milk production as a way of overcoming goat-milk marketing constraints.

Agricultural Trainings and Workshops

There is a gap identified with regard to agricultural trainings in South Africa. This shortfall results in inefficiency and poor performance of agricultural production. Janine (2013) reports that South Africa's agricultural education sector is failing to produce agricultural education tools to youngsters drawn to study agriculture and in addition to unskilled and semi-skilled agricultural workers in order to make SA farming more profitable.

Fewer dairy-goat farmers (at 7%), mainly those who attended tertiary education, suggested that the government and/or other agricultural organisations should provide them with trainings and workshops. These provisions will teach them new ways of improving dairy-goat production, and assist them to adopt and use advanced technologies. To enhance efficiency and effectiveness of dairy-goat production and goat-milk marketing, similarly, Gebeyehu *et al*. (2013) observs that farmers in rural

areas are willing and eager to use modern technologies. This willingness is informed by their belief that improved management, as well as the use of new technologies, will improve production and productivity of their dairy-goat and goat-milk marketing.

CHAPTER SIX
CONCLUSION AND RECOMMENDATIONS

The following conclusions were made from the present study.

It has been established that dairy goat production and goat milk marketing in the Sekhukhune District is practised more by women than men even as this activity is rarely practised by youths. Dairy goats in the Sekhukhune District rely more on natural pastures and less on supplementary feeds for their survival with the majority of the farmers keeping four dairy goats in one kraal. Further to this, the results of the Probit analysis reveals that safety of dairy goat and grazing land are major constraints of dairy goat production while, breeding and processing are major constraints of goat milk marketing faced by rural household dairy goat farmers. However, aside from these constraints, breeding, processing and grazing land are the factors that significantly increases the farmers' decision to milk dairy goat.

In order to enhance the productivity of dairy goat production and goat milk marketing in the Sekhukhune District of the Limpopo Province, the following strategies as suggested by the farmers need to be adopted:

- The government should intervene to support dairy goat farmers with the linkages of available effective goat milk markets and perhaps aid them to create their own markets.
- Farmers also revealed that the government should help them form a dairy goat cooperative society through which they could establish dairy goat camps to overcome dairy goat insecurity.
- Dairy goat farmers in the study area also suggested that the government should revisit their policies and provide them with veterinary services for both their goats and cows.
- The government and/or other agricultural organization should provide dairy goat farmers with trainings and workshops through which, they will learn new ways of improving dairy goat production and assist them to adapt and use advanced technologies.

Finally, further studies are recommended in the study area to assess, identify and solve the problems faced by rural household farmers in Sekhukhune District pertaining to dairy goat production and goat milk marketing.

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APPENDICES

Appendix A: QUESTIONNAIRE

ASSESSMENT OF THE PRODUCTION AND MARKETING CONSTRAINTS OF DAIRY GOAT AND GOAT MILK FACED BY RURAL HOUSEHOLD GOAT FARMERS IN SEKHUKHUNE DISTRICT OF LIMPOPO PROVINCE SOUTH AFRICA

COLLEGE OF AGRICULTURE AND ENVIRONMENTAL SCIENCE

UNIVERSITY OF SOUTH AFRICA

NAME OF ENUMARATOR ……
DATE OF INTERVIEW ……
NAME OF LOCAL MUNICIPALITY ……
NAME OF VILLAGE …… ……

SECTION A

SOCIO-ECONOMIC QUESTIONS

1. Name of rural household farmer ……
2. Age of respondent ……
3. Gender

Female		Male	

4. Marital status of rural household farmer

Single	
Married	
Widowed	
Divorced	

5. Educational level of rural household farmer

No schooling	
Primary	
Secondary	
Tertiary	

6. Source of income for rural household farmer

Salary	
Farming	
Social grants	
Pension	
Other (specify)……	

DAIRY GOAT PRODUCTION

1. How many dairy goats do you rear? | |

2. Do you purchase feeds for your dairy goat?

Yes		No	

3. Do you afford dairy goat feeds prices?

Yes		No	

4. How do you rate availability of dairy goat feed in the near market?

Not available	
Sometimes	
Always	

5. How often do you feed your dairy goats per day?

Never	
Once	
Twice	

6. How many kraals do you have? …….

7. Do you clean the kraal?

Yes		No	

8. Do you provide veterinary health service to check your dairy goats?

Yes		No	

9. Do you have goats' herds?

Yes		No	

10. When does your dairy goat use the kraal?

During the day	
At night	
Day and night	

11. How do you perceive safety of your goats?

Safe	
Not safe	

12. Did you breed your dairy goat? Yes [ ] No [ ]

13. Do you have grazing land for you dairy goats?

Yes		No	

14. Please tick on production constraints you are facing.

Production Constraints	**Tick**
Breeding	
Safety	
Grazing Land	
Cleanliness of kraal	
Veterinary health service	
Feeds shortage	
Feeds Availability	
Feeds Affordability	

15. What do you suggest must be done to improve your dairy goat production?

……
……
……
……

SECTION C: MARKETING OF GOAT MILK

1. What do you use for milking your goat?

You hand	
Manmade machine	
Other (specify)	

2. Why do you do the milking?

Consumption purpose	
Commercial purpose	
Both consumption and commercial	

3. Do you add value (own processing) to your goat milk?

Yes		No	

4. Do you have storage facilities (refrigerator) for your milk?

Yes		No	

5. Do you have access of market information?

Yes		No	

6. Do you have market to sell your milk?

Yes		No	

7. If yes, where do you sell your milk?

Farm/household gate	
Hawker market	
Shops/Retail	
Other(specify)	

8. Do you have person (middlemen) to sell your milk?

Yes		No	

9. Do you have transport facilities for you delivery?

Yes		No	

10. Please indicate on marketing constraints you are facing

Marketing Constraints	**Tick**
Milking equipment	
Processor	
Refrigerator	
Middlemen	
Market information	
Market availability	
Middlemen	
Transport facility	

11. What do you suggest must be done to improve your marketing skills and knowledge for your goat milk?

……
……
……
……..

Thank for your time and cooperation!!!!

Appendix 2. REQUEST LETTER FOR DATA COLLECTION

Director: Department of Agriculture and Rural development

Sekhukhune District

Private bag X 01

Cheuniespooort

0745

REQUEST FOR PERMISSION TO CONDUCT RESEARCH

Attention: animal production

I am a registered Master's student in the Department of Agriculture and Environmental science at the University of South Africa(UNISA). My supervisor is Prof CA mbajiorgu.

I write to request your permission to collect data from Sekhukhune District targeting Rural Households Dairy Goat Farmers on the study I am carrying (Assessment of the Production and Marketing Constraints of Dairy Goat and Goat Milk faced by Rural Household Goat Farmers in Sekhukhune District of Limpopo province South Africa.)

Should you require any further information, please do not hesitate to contact me or my supervisor. Our contact details are as follows:

Student: 0714120516; Supervisor: 0114713590

Upon completion of the study, I undertake to provide you with a bound copy of the dissertation.

Your permission to conduct this study will be greatly appreciated.

Yours sincerely,

Signature: 17/08/2016

Name: Maesela Lesedi

Appendix 3: APPROVAL LETTER FOR DATA COLLECTION

RESTRICTED

LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
AGRICULTURE AND RURAL DEVELOPMENT

SEKHUKHUNE DISTRICT

REF: 10/ 4/ 2
ENQ: Ntsoane M.A.
DATE: 29 August 2016

Lesedi Maesela
Room 35 NIX Accommodation
274 Steve Biko Road
GEZINA
0084

RE: REQUEST FOR PERMISSION TO CONDUCT RESEARCH IN SEKHUKHUNE DISTRICT.

Receipt of your request to conduct a survey towards your studies is hereby acknowledged.

Approval to conduct the study in goat farming is hereby granted. Note that Sekhukhune District has five Municipalities, all of which have communal goat farmers. As the area is too wide, it is advisable that you select a manageable area for data collection. This should however, first be discussed with your study Supervisor.

Looking forward to a successful working relationship

Regards

30/8/2016

Mathebula C.J.
Director: Sekhukhune District:
Agriculture

Appendix 4: RESEARCH ETHICS CLEARANCE

UNISA university of south africa

CAES RESEARCH ETHICS REVIEW COMMITTEE

National Health Research Ethics Council Registration no: REC-170616-051

Date: 14/10/2016

Ref 2016/CAES/Ö76
Name of applicant: Ms LM Maesela
Student 58527435

Dear Ms Maesela,

Decision: Ethics Approval

Proposal: Assessment of the production and marketing constraints of dairy goat and goat milk faced by rural household goat farmers in Sekhukhune District of Limpopo Province
South Africa

Supervisor: Prof C Mbajiorgu

Qualification: Postgraduate degree

Thank you for the application for research ethics clearance by the CAES Research Ethics Review Committee for the above mentioned research. Approval is granted for the project.

Please note that the approval is valid for a one year period only. After one year the researcher is required to submit a progress report, upon which the ethics clearance may be renewed for another year.

Due date for progress report: 31 October 2017

Please note points 4 and 5 below for further action.

The application was reviewed in compliance with the Unisa Policy on Research Ethics by the
CAES Research Ethics Review Committee on 13 October 2016.

The proposed research may now commence with the proviso that:
1) The researcher/s will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.
2) Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study, as well as changes in the methodology, should be communicated in writing to the CAES Research Ethics Review Committee. An amended application could be requested if there are substantial changes from the existing proposal, especially if those changes affect any of the study-related risks for the research participants.
3) The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study.
4) The questionnaire contains questions on the success of the farmer, which may cause embarrassment to the participant if the proper measures are not put in place to safeguard the confidentiality of these questionnaires. The researcher is advised not to ask for the name of participants on the questionnaire, but to rather use depersona/ised identifiers. The questionnaires must also be stored in a safe place.
5) The consent form must be corrected before it is used — the researcher must provide the name of the Ethics Committee on page 2 (CAES Genera/ Ethics Committee).

Note:
The reference number [top right corner of this communiqué] should be clearly indicated on all forms of communication [e.g. Webmail, E-mail messages, letters] with the intended research participants, as well as with the CAES RERC.

Kind regards,

Signature
CAES RE-RC Chair: Prof EL Kempen

Signature 

CAES Executive Dean: Prof MJ Linington